CONODONTS FROM THE RUSHVILLE FORMATION (MISSISSIPPIAN) OF OHIO

by

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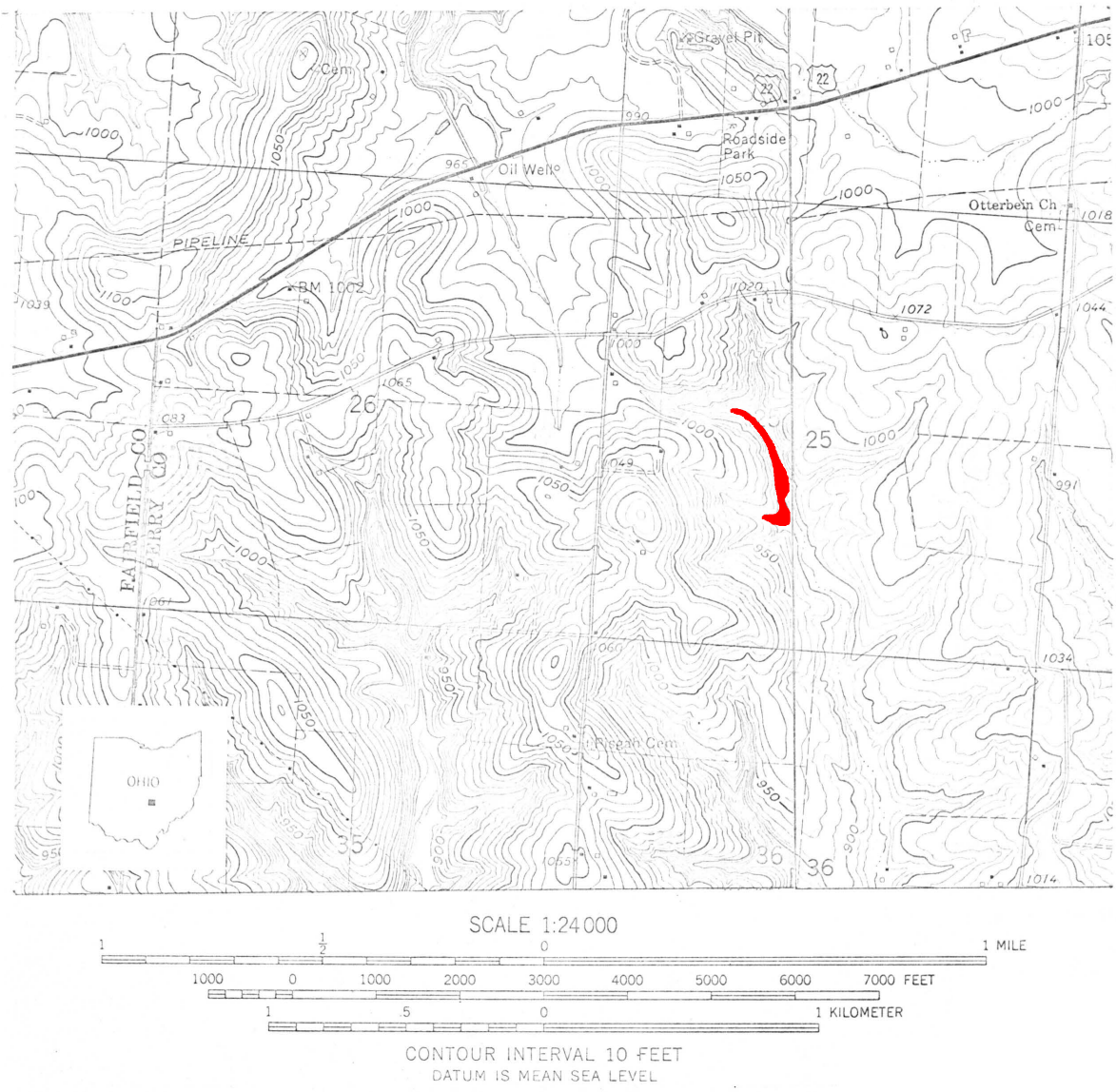
ABSTRACT--A type section is specified for the Mississippian Rushville Formation of central Ohio, and correlation of a limestone at the base of the formation with the Fern Glen and lower Burlington Formations of the standard Mississippi Valley section is proposed, on the basis of a study of conodonts. A new species, Bactrognathus reversus, is described.

INTRODUCTION

The rocks here included in the Rushville Formation were first termed the Rushville Group by Andrews (1879), who described them as a series of red and blue clay shales with a fifteen-inch layer of ferruginous fossiliferous limestone at the base. Although an accurate location was not given by Andrews, the outcrop he described was presumably near Rushville, Ohio, a small town near the eastern edge of Fairfield County. A section in an abandoned quarry in Jockey Hollow ($NE\frac{1}{4}SW\frac{1}{4}$ sec. 25, Reading Twp., Perry County, Ohio) was measured by Morse (1910), who reported about 24 feet of red and bluish-gray argillaceous shale with a basal layer of reddish to brownish crinoidal limestone one foot thick. In this section, which we regard as the type section, the Rushville is underlain, perhaps disconformably, by the Vinton Member of the Logan Formation which is composed of fine-grained greenish-gray sandstone (Flint, 1951). The Jonathan Creek Formation of the Maxville Group



TEXT-FIG. 1.--Parts of the Rushville and Somerset 7.5-minute quadrangles, Ohio, with the location of the type section of the Rushville Formation indicated in red (NE¼SW¼ sec. 25, T.17N., R. 17W.; Reading Twp., Perry County, Ohio).

disconformably overlies the type Rushville (Scatterday, 1963). Flint (1951) suggested that the Rushville may be an equivalent of the West Virginia Maccrady "Series," which is disconformably overlain by the Greenbriar Limestone, an equivalent of the Maxville Group.

In addition to the section regarded here as the type section, Morse (1910) described two other sections, both very close to the type section, in which Rushville strata are exposed. No other positively identified exposures of this unit are known. Fagadau (1952) was apparently unable to locate the sections described by Morse, but regarded six feet of gray shale exposed some two miles south of Somerset, Perry County, Ohio, along Ohio Route 668, as possibly referable to the Rushville. The writer has studied this section, but has been unsuccessful in collecting conodonts from it. Hence, it is still uncertain whether or not these shales should be included in the Rushville.

LABORATORY PREPARATION

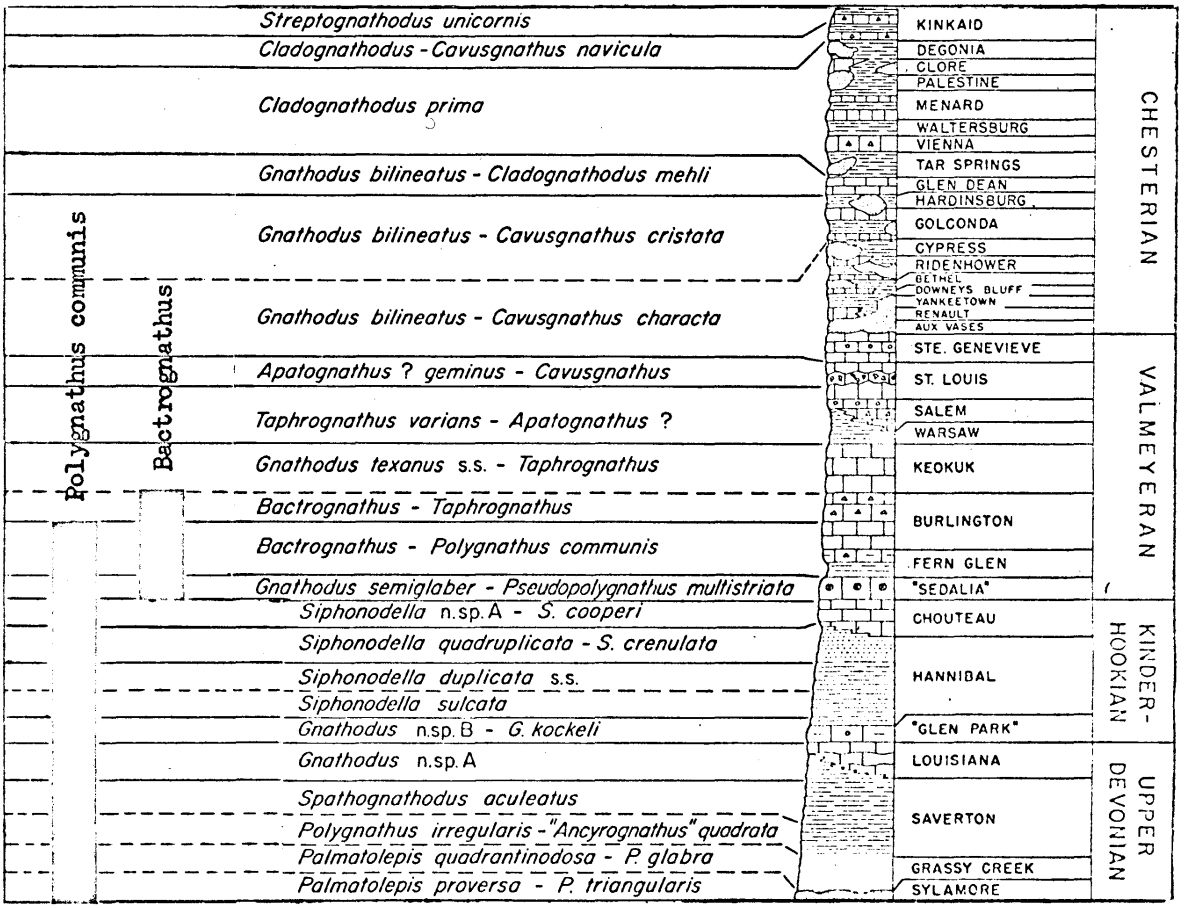
The conodonts on which this paper is based were taken from 19,500 grams of gray crinoidal limestone collected from a one-foot thick ledge exposed 24 feet below the base of the Maxville Group at the type section of the Rushville Formation. The limestone was reduced by prolonged immersion in 15% acetic acid and the resultant residue was then concentrated first by use of a Franz Isodynamic Magnetic Separator and then further concentrated with

tetrabromoethene, a heavy liquid. From the concentrated residue 459 identifiable conodont-elements were picked. These are referable to seven form-species and seven form-genera.

CORRELATION

There is no doubt that the rocks above and below the Rushville at its type section are Mississippian in age. Maxville strata above the type Rushville contain a basal conglomerate that includes pebbles of an earlier Maxville unit, which Scatterday (1963) has shown to be equivalent in age to the St. Louis Limestone of the standard Mississippian section. Consequently, the Rushville is reasonably interpreted as being pre-St. Louis in age. This interpretation is confirmed by the fact that the conodonts identified in the basal part of the type Rushville include representatives of Bactrognathus, which ranges from the upper part of the zone of Gnathodus semiglaber-Pseudopolygnathus multistriata through the Bactrognathus-Polygnathus communis and Bactrognathus-Taphrognathus zones of the Upper Mississippi Valley and southwestern Missouri (text-fig. 2: Collinson, et al., 1962; Thompson, 1967). In both places the zones in which representatives of Bactrognathus are found are in pre-St. Louis post-Kinderhook strata; that is, in the "Sedalia," Fern Glen and Burlington Formations and their lateral equivalents.

The Rushville has also produced numerous representatives of Polygnathus communis (Branson and Mehl, 1934) which has a long range



TEXT-FIG. 2.--Chart showing Upper Devonian and Mississippian formations and conodont zones of the standard Mississippian section (after Collinson, Scott, & Rexroad, 1962). The upper ranges of Polygnathus communis and all of the range of Bactrognathus are shown by bars at the left. Since the basal Rushville lacks Pseudopolygnathus but contains Polygnathus communis and representatives of two species of Bactrognathus, it belongs in the Bactrognathus-Polygnathus communis zone.

in the Upper Devonian and Lower Mississippian, but is not known to occur above the middle of the Burlington Formation of the Upper Mississippi Valley. The common occurrence of Polygnathus communis and Bactrognathus defines a concurrent-range zone in the Fern Glen and lower Burlington Formations (Collinson, et al., 1962) and the writer concludes that at least the basal Rushville of Ohio belongs in this zone.

A conclusion, based on a study of conodonts, that the basal Rushville is equivalent in age to part or all of the interval occupied by the Fern Glen and lower Burlington Formations of the Upper Mississippi Valley, has a profound effect on previous conclusions with respect to correlation of the underlying Cuyahoga and Logan Formations (Weller, et al., 1948; Fagadau, 1952). Weller, et al., show the Cuyahoga as an approximate correlative of the Chouteau through Burlington Formations of the standard Mississippian section, and the Logan as an equivalent of the upper Burlington and Keokuk Formations. Fagadau (1952) agrees with Weller, et al's., correlation of the Logan Formation, but concludes that the Cuyahoga is "...probably equivalent to the lower Burlington." The writer believes that the Cuyahoga and Logan are placed much too high, relative to the standard section, by Weller, et al., and Fagadau.

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SYSTEMATIC PALEONTOLOGY

The majority of the species represented by specimens in the collection at hand from the type Rushville have been described adequately in the recent literature. Therefore, descriptions of most of the species represented in the Rushville collection are not included, but all forms are illustrated on Plate 1 for comparative purposes. One species is new and is described under the name Bactrognathus reversus. Type and figured specimens are cataloged in the Orton Museum of Geology at The Ohio State University.

Genus BACTROGNATHUS Branson & Mehl, 1941

BACTROGNATHUS HAMATUS Branson & Mehl, 1941

Pl. 1, figs. 24-27, 30, 31

Bactrognathus hamata BRANSON & MEHL, 1941, p. 98, pl. 19, figs. 5-8. ----- REXROAD & SCOTT, 1964, p. 23, pl. 3, figs. 15-17. -----THOMPSON, 1967, p. 31-32, pl. 1, figs. 11, 14.

Bactrognathus penehamata HASS, 1959, p. 381, pl. 46, figs. 22, 23, 29. -----BURTON, 1964, p. 74, chart.

Material.--20 discrete specimens.

Remarks.--Specimens from the Rushville Formation are similar in comparable features to the types and are included in Bactrognathus hamatus without question.

Types.--Figured hypotypes, OSU 28336, 28337.

BACTROGNATHUS REVERSUS Ford, n. sp.

Pl. 1, figs. 8, 12, 13, 15, 16

Diagnosis.--A form-species distinguished by essentially straight, blade-shaped elements, in which the outer sheath of the basal pit is produced into a posteriorly directed subspatulate structure that bears a node-like denticle or denticles.

Material.--13 discrete elements.

Description.--Straight or slightly bowed, laterally compressed, blade-shaped elements with an anterior process that is about twice the length of the posterior process. The anterior process bears a series of 13 or more erect denticles, which are laterally confluent, apically discrete, and increase slightly in length toward the distal end of the process. The posterior process bears about five denticles, which are similar to those of the anterior process, but decline in length toward the posterior end of the element. In large specimens, denticles on both processes fuse to their apices and the upper edge of the element in such specimens is a smooth-edged ridge.

The under side of the elements of Bactrognathus reversus is shallowly grooved beneath the distal two-thirds of the anterior and posterior processes, but beneath the cusp and the proximal third of the processes the attachment surface is in a deep asymmetrically subconical basal pit, the sheathes of which are developed unequally on opposite sides of the blade. On the outer side, the sheath is a subspatulate structure with an axis that is directed outwardly and slightly posteriorly and a basal margin that joins the posterior process to form an angle of slightly less than 90°, but grades in

a smooth curve into the anterior process. The upper surface of the outer sheath is marked in small specimens by a node-like denticle, and in larger specimens by a ridge of fused denticles like those of the anterior and posterior processes. The inner sheath projects laterally about half as far as the outer sheath, has an almost evenly convex outline, has an axis directed inwardly and slightly anteriorly, and its basal margin joins that of the anterior and posterior processes somewhat before and behind the points of junction of the outer sheath.

Remarks.--Bactrognathus reversus is morphologically intermediate between forms included in B. excavata (Branson & Mehl, 1941) and those referred to Doliognathus dubia by Branson and Mehl (1941). The species is included in Bactrognathus, rather than Doliognathus, however, because its elements lack the platform-like lateral ledges that are characteristic of previously described species of Doliognathus. Elements of some species of Bactrognathus are less strongly deflected laterally than those of other species, and some develop nodes on the upper surface of the sheath. However, none is known to develop the lateral platforms of Doliognathus. Bactrognathus reversus is readily distinguished from B. hamatus, the type-species, by its essentially straight blade and nodose outer sheath.

Types.--Holotype, OSU 28338; paratype, OSU 28339.

Genus GNATHODUS Pander, 1856

GNATHODUS ANTETEXANUS Rexroad & Scott, 1964

Pl. 1, figs. 3, 4, 5

Gnathodus texanus (Roundy), MEHL & THOMAS, 1947, p. 10, pl. 1, fig. 3. -----BISCHOFF (part), 1957, p. 25, pl. 3, fig. 22.-----VOGES, 1959, p. 284, pl. 33, fig. 40, 42.-----ZIEGLER, 1963, p. 326, pl. 2, fig. 1, 2, 3, 6.-----BURTON, 1964, p. 75, chart.

Gnathodus n. sp. aff. G. texanus (Roundy) COLLINSON, SCOTT & REXROAD, 1962, chart 3.

Gnathodus antetexanus REXROAD & SCOTT, 1964, p. 28, pl. 2, fig. 7-10. -----THOMPSON, 1967, p. 36, pl. 5, fig. 1, 5-7.

Material.--4 fragmentary specimens.

Types.--Figured hypotypes, OSU 28340, 28341, 28342.

Genus LIGONODINA Bassler, 1925

LIGONODINA (?) COMPRESSA Mehl & thomas, 1947

Pl. 1, fig. 10, 14, 17, 19, 20

Ligonodina compressa MEHL & THOMAS, 1947, p. 11, pl. 1, fig. 31.

Lonchodina (?) excavata MEHL & THOMAS, 1947, p. 13, pl. 1, fig. 33.

Prioniodus compressus MEHL & THOMAS, 1947, p. 15, pl. 1, fig. 24.

Trichognathus dubia MEHL & THOMAS, 1947, p. 18, pl. 1, fig. 17.

Trichognathus sp. MEHL & THOMAS, 1947, p. 19, pl. 1, fig. 18.

Material.--72 specimens.

Remarks.--Conodont-elements of the types figured on Plate 1 and representative of at least the four species listed above occur together in the basal Rushville and in the Fern Glen of Missouri. It cannot be demonstrated from the Rushville collection alone that all these elements were skeletal components of a single "natural"

species. They are of similar size and color, however, and they have a common plan of denticulation. Further, they represent the "Cordylodus-Roundya" transition series of Lindström (1964), and it has been demonstrated (Bergström & Sweet, 1966; Rhodes, 1952) in collections that are from rocks both older and younger than the Rushville that this was a persistent skeletal plan in multi-element conodont species.

An assignment to Ligonodina of the multi-element species that may be represented by the aggregation of form-species listed above is necessarily tentative, for it is not known if the type form-species of Ligonodina was part of a multi-element apparatus of the "Cordylodus-Roundya" transition series.

Types.--Figured hypotypes, OSU 28343, 28344, 28345, 28346.

LIGONODINA (?) ORTHA (Cooper, 1939)

Pl. 1, fig. 11, 23, 28

Neocordylodus orthus COOPER, 1939, p. 396, pl. 46, fig. 53, 59, 60, 66, 72, pl. 47, fig. 4, 14.

Ligonodina ortha (Cooper) MEHL & THOMAS, 1947, p. 12, pl. 1, fig. 34.

-----BISCHOFF, 1957, p. 31, pl. 5, fig. 10, 11.

?Lonchodina minuta MEHL & THOMAS, 1947, p. 12, pl. 1, fig. 20.

Material.--11 specimens.

Remarks.--The eleven specimens studied appear to include representatives of both Ligonodina ortha and ?Lonchodina minuta. This assemblage of form-species is regarded as a "natural" species

of Ligonodina for the same reasons used above in interpreting the assemblage named Ligonodina (?) compressa.

Types.--Figured hypotypes, OSU 28347, 28348, 28349.

Genus NEOPRIONIODUS Rhodes & Müller, 1956

NEOPRIONIODUS SP., CF. N. LANCEOLATUS Hass, 1959

Pl. 1, figs. 29, 32

cf. Neoprioniodus lanceolatus HASS, 1959, p. 384, pl. 46, fig. 1, 2, 8.

Material.--180 discrete elements.

Remarks.--The specimens at hand are generally similar to figured representatives of Neoprioniodus lanceolatus and are variable in the angle at which the cusp is proclined. However, only a few Rushville specimens have a cusp that is as strongly proclined as that of the types of Neoprioniodus lanceolatus. Most have a cusp that is more nearly like that of the forms Rexroad & Collinson (1963) have referred to Neoprioniodus tulensis (Pander). The Rushville specimens are compared with Hass's species, despite the difference in cusp inclination, because it is doubtful that anyone will be able to recognize Pander's Neoprioniodus tulensis until its types are found.

Types.--Figured hypotypes, OSU 28350, 28351.

Genus POLYGNATHUS Hinde, 1879

POLYGNATHUS COMMUNIS Branson & Mehl, 1934

Pl. 1, fig. 6, 9

Polygnathus communis BRANSON & MEHL, 1934, p. 293, pl. 24, fig. 1-4. -----ZIEGLER, 1963, p. 328, pl. 1, fig. 5, 8.-----THOMPSON, 1967, p. 46, pl. 2, fig. 12, 13, 15, 16 (includes complete synonymy through 1966).

Material.--155 specimens.

Remarks.--Representatives of Polygnathus communis are common in the basal Rushville of Ohio. These specimens probably should be included in the subspecies P. communis communis (Branson & Mehl, 1934) which is distinguished from P. communis carina (Hass, 1959) by elements with a smooth platform, but this subspecies has a range identical with the species and the subspecific affinities of the Rushville specimens are thus of little stratigraphic significance.

Types.--Figured hypotype, OSU 28352.

Genus OZARKODINA Branson & Mehl, 1933

OZARKODINA SPP.

Pl. 1, fig. 1, 2, 22

Material.--5 specimens.

Remarks.--Representatives of the form-genus Ozarkodina are not particularly numerous in the Rushville collection. Three distinct types are represented, however, and a specimen of each is figured on Plate 1.

Types.--Figured specimens, OSU 28353, 28354, 28355.

Genus SYNPRIONIODINA Bassler, 1925

SYNPRIONIODINA SP.

Pl. 1, fig. 7

Material.--1 specimen.

Type.--Figured specimen, OSU 28356.

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EXPLANATION OF PLATE 1

All figures are of uncoated specimens from the Rushville Formation; X38.

FIGS. 1,2--Ozarkodina sp. Lateral views of two specimens. OSU 28353, 28354.

3,4,5--Gnathodus antetexanus REXROAD & SCOTT. Lateral and superior views of three fragmentary specimens. OSU 28340, 28341, 28342.

6,9--Polygnathus communis BRANSON & MEHL. Superior and lateral views of a typical specimen. OSU 28352.

7--Synprioniodina sp. Lateral view of the only representative of this form-genus in the Rushville collection. OSU 28356.

8,12,15; 13,16--Bactrognathus reversus FORD, n. sp. Superior, lateral, and inferior views of the holotype (figs. 8,12,15); superior and inferior views of a paratype (figs. 13,16). OSU 28338, 28339.

10,14,17,19,20--Ligonodina? compressa MEHL & THOMAS. 10, Posterior view of a representative of the form-species Trichonodella dubia (MEHL & THOMAS). 14, Lateral view of a specimen intermediate between the form-species Ligonodina compressa MEHL & THOMAS and Neoprioniodus compressus (MEHL & THOMAS). 17, Lateral view of a ligonodina-like element. 19,20, Posterior and lateral views of a trichonodella-like element. OSU 28343, 28344, 28345, 28346.

11,23,28--Ligonodina? ortha (COOPER). 11, Posterior view of a trichonodella-like element. 23, Posterior view of a possible representative of the form-species Lonchodina minuta MEHL & THOMAS. 28, Lateral view of a specimen of the form-species

Ligonodina ortha (COOPER). OSU 28347, 28348, 28349.

FIGS. 18,21--Gen. et sp. indet. Superior and inferior views of a fragmentary platform element of unknown affinities. OSU 28357.

22--*Ozarkodina* sp. Lateral view. OSU 28355.

24,26,30; 25,27,31--*Bactrognathus hamatus* BRANSON & MEHL. Superior, inferior, and lateral views, respectively, of two specimens. OSU 28336, 28337.

29,32--*Neoprioniodus* sp. cf. *N. lanceolatus* HASS. Lateral view of two specimens. OSU 28350, 28351.

PLATE 1


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